

DESCRIPTION

METHOD AND APPARATUS FOR PUTTING ON GLOVES AND GLOVES

Technical Field

The present invention relates to a glove donning method, a system for carrying out the method, and a glove used therewith. More specifically, the present invention relates to a method and system for donning a thin glove especially suitable for use in a food processing plant and the like and fabricated from a substantially unstretchable material, such as polyethylene, and relates to such a glove used therewith.

Background Art

Heretofore, there have been proposed various methods and systems for enabling a person to don a glove by merely inserting his or her hand through the cuff or opening of the glove.

For example, Japanese Unexamined Patent Publication No. 10(1998)-108870 discloses a method and apparatus for donning a glove, made from an elastically expandable material, to encase a wearer's hand. This method comprises mounting the glove cuff on a retaining means in a manner such that the glove cuff faces upward by expanding the opposed surfaces of the glove cuff against the elastic restoring force thereof, donning the glove by inserting the hand of a user through the expanded glove cuff, releasing the retaining means, and removing the glove from the retaining means.

However, the foregoing glove donning method is disadvantageous in that:

(1) this method is not applicable to a substantially unstretchable glove fabricated from a material such as polyethylene, since the method requires expansion of the glove cuff against its elastic restoring force while retaining the glove cuff;

(2) since the user has to mount gloves one by one

onto the glove retaining means prior to donning, some amount of labor and time therefor is necessary;

5 (3) as the user's hand touches the fingers of the glove during mounting the gloves one by one on the glove retaining means, hygiene of the glove is lost and a dedicated mounting unit is necessary.

10 In view of the foregoing, an object of the present invention is to provide a method and system for donning a substantially unstretchable thin glove for use in a food processing plant and the like very quickly and safely, while maintaining the hygiene of the glove, and a glove used therewith.

Disclosure of Invention

15 A glove donning method of the invention preferably comprises the steps of:

hanging gloves in a state such that the gloves are arranged one behind the other, by engaging the upper portion of the gloves with the cuff of each glove being directed upward;

20 opening the cuff of the foremost one of the gloves to an extent sufficient to enable a hand to be inserted therethrough; and

25 applying a force to the glove to disengage the glove after inserting the hand through the opened cuff from above.

30 In the preceding method, it is preferable that: one of the cuff edges respectively corresponding to the back-side and palm-side parts of the glove, for example, the cuff edge of a palm side part of the glove, is provided to be offset closer to the glove fingers compared with the other cuff edge i.e. a cuff edge of a back side part of the glove; and the gloves are hung in a state such that the glove part, whose cuff edge is positioned below the other when the glove is hanging, i.e. the palm side part, 35 is placed in front, by engaging a portion of the of the

rearward glove part, i.e. the back side part. The portion is located in the vicinity of the upper cuff edge of the rearward glove part whose cuff edge is positioned above the other, i.e. the back side part, and above the lower 5 cuff edge i.e. the cuff edge of the palm side part.

A glove donning system of the invention preferably comprises:

hanging means for hanging gloves, in which one of two cuff edges respectively corresponding to the back-side and 10 palm-side parts of the glove, for example, the cuff edge of the palm side part of the glove, is provided to be offset closer to the glove fingers compared with the other cuff edge, i.e., the cuff edge of the back side part of the glove, with the gloves being arranged one behind the 15 other in a state such that the cuff of each glove is directed upward, the glove part, whose cuff edge is positioned below the other when the glove is hanging, i.e. the palm side part, is placed in front; and such that a portion, located in the vicinity of the upper cuff edge, 20 i.e. the back side part, and above the lower cuff edge, i.e., the palm side part, of the rearward glove part whose cuff edge is positioned above the other, i.e. the back side part, is engaged;

opening means for opening the cuff of the foremost 25 one of the hanging gloves to an extent sufficient to enable a hand to be inserted therethrough; and
drive means for driving the opening means.

The hanging means preferably comprises a holding rod, for example, two rods, which extend substantially 30 horizontally in the front-rear direction through a hole formed in the glove part having the cuff edge positioned above the other, i.e., the back side part, in the vicinity of the cuff edge thereof, and the gloves are hung from the holding rods with the gloves being arranged one behind the 35 other.

The opening means preferably comprises a pair of glove-inter-surface separation plates which is inserted from above into the forefront glove through the front lower cuff edge, i.e., through the cuff edge of the palm side part, such that the plates are held in a position substantially parallel to the relevant cuff edge, and then rotated about 90° respectively around vertically extending shafts, thereby opening the cuff of the glove.

It is preferable that a pressing means is provided which resiliently presses forward a portion, located in the vicinity of the cuff edge positioned below the other, of the rearmost rearmost one of the gloves hanging from the hanging means.

Further, the drive means is preferably of a type operated by a foot-pedal.

A glove used with the foregoing method and system is characterized in that one of two cuff edges respectively corresponding to the back-side and palm-side parts of the glove, for example, the cuff edge of the palm side part of the glove, is provided to be offset closer to the glove fingers compared with the other cuff edge, i.e., the cuff edge of the back side part of the glove, and an engagement portion, which enables the glove to be hung with the glove cuff being directed upward, is formed at a portion, located in the vicinity of the other cuff edge, i.e., the cuff edge of the back side part, and above the lower cuff edge, i.e., the cuff edge of the palm side part, of the glove part having the other cuff edge.

The engagement portion may be a hole which enables the holding rod to be inserted therethrough, and it is preferable that a frangible portion is provided between this hole and the cuff edge in the vicinity of the hole, thereby facilitating communication therebetween. This frangible portion may be, for example, a perforated line extending between the aforementioned hole and the cuff

edge in the vicinity of the hole.

Further, the hole through which the holding rod passes may be a cruciform slit.

5 The glove donning system of the invention preferably has a glove housing magazine for housing therein gloves, which are removably mounted thereto.

10 The glove housing magazine is characterized in that it houses therein gloves in a hanging state, each of which has a cuff edge of either a back side part or a palm side, for example, the cuff edge of a palm side part, formed to be offset closer to the glove fingers compared with the other cuff edge, i.e., the cuff edge of the back side part, such that the gloves are arranged one behind the other in a state such that: the cuff of each glove is directed 15 upward; the glove part whose cuff edge is positioned below the other, i.e., the palm side part, is placed in front; and the gloves are engaged at a portion, located in the vicinity of this upper cuff edge and above the other lower cuff edge, of the glove part which is placed behind and 20 has the upper-positioned cuff edge, i.e., the back side part.

25 The glove housing magazine preferably comprises a holding rod, for example, two rods, which extend substantially horizontally in the front-rear direction through a hole formed in the rearward glove part, i.e., the back side part, having the cuff edge positioned above the other, in the vicinity of the cuff edge thereof, and the gloves are hung from the holding rods with the gloves being arranged one behind the other.

30 The glove housing magazine preferably further comprises a pressing means for resiliently pressing forward a portion, located in the vicinity of the cuff edge positioned below the other, of the rearmost/rearmost one of the gloves hanging from the holding rods from 35 behind.

While the aforementioned glove is provided such that the cuff edge of the palm side part is offset closer to the glove fingers compared with the cuff edge of the back side part, conversely, it is also possible to provide a 5 glove such that cuff edge of the back side part is offset closer to the glove fingers compared with the cuff edge of the palm side part, as a result of which the glove is hung by engaging a portion of the palm side part in the vicinity of the cuff edge thereof with the back side part 10 being positioned in front and the palm side part being positioned behind.

According to the glove donning method of the invention, gloves are hung in a state such that they are arranged one behind the other by engaging the upper 15 portion of the gloves with the cuff of each glove being directed upward, and the cuff of the foremost one of the hanging gloves is opened to the extent sufficient to enable a hand to be inserted therethrough. Thus, it is possible to don the glove onto a hand in a moment merely 20 by inserting the hand through the cuff of the forefront glove, without loss of hygiene of the glove

Further, a glove used for this method is a glove wherein one of two cuff edges respectively corresponding to the back-side and palm-side parts of the glove, for 25 example, the cuff edge of the palm side part of the glove, is provided to be offset closer to the glove fingers compared with the other cuff edge, i.e., the cuff edge of the back side part of the glove, and an engagement portion, which enables the glove to be hung with the glove cuff 30 being directed upward, is formed at a portion, located in the vicinity of the other cuff edge, i.e., the cuff edge of the back side part and above the lower cuff edge, i.e., the cuff edge of the palm side part, of the glove part having the other cuff edge. Consequently, despite the fact 35 that a substantially unstretchable glove is used,

engagement of the gloves in a hanging state with the glove cuff of each glove being directed upward and the palm side part of the glove being placed in front, insertion of a hand through the cuff, and disengagement of the glove 5 after inserting therein a hand are greatly facilitated. Especially, when a frangible portion such as a perforated line is formed between an engagement portion and the cuff edge in the vicinity of the engagement portion, disengagement of the glove is advantageously further 10 facilitated.

The glove donning system of the present invention comprises: hanging means for hanging the gloves designed as described above, wherein the gloves are hung with the gloves being arranged one behind the other in the state 15 that the cuff of each glove is directed upward, the glove part, whose cuff edge is positioned below the other, is placed in front, and the gloves are engaged at a portion, located in the vicinity of this upper cuff edge and above the other lower cuff edge, of the glove part whose cuff 20 edge is positioned above the other; and an opening mechanism for opening the cuff of the foremost one of the hanging gloves to the extent sufficient to enable a hand to be inserted therethrough. Accordingly, it is possible to don gloves onto hands in a moment merely by inserting 25 the hands through the cuffs of the forefront gloves, without loss of hygiene of the gloves.

Further, the foregoing glove opening mechanism may comprise a pair of glove-inter-surface separation plates, which is inserted from above into the glove through the 30 front lower cuff edge such that the plates are held in a position substantially parallel to the cuff edge, and then rotated about 90° respectively around vertically extending shafts, thus opening the cuff of the glove. Accordingly, opening the glove cuff to the extent sufficient to enable 35 the hand to be inserted therethrough would be

significantly facilitated. Also here, the opening mechanism further may comprise pressing means for resiliently pressing forward a portion, located in the vicinity of the cuff edge positioned below the other, of 5 the rearmost one of the hanging gloves from behind. This causes the respective hanging gloves to be bulged forward at a region near the lower cuff edge, whereby the lower cuff edge facing forward of each forefront glove opens toward the front. Accordingly, inserting the pair of 10 glove-inter-surface separation plates into the glove through the lower cuff edge would be facilitated.

Further, in the present invention, glove housing magazines are used as hanging means for hanging a plurality of gloves having the features mentioned above 15 with the gloves being arranged one behind the other, whereby, advantageously, the mounting and replenishing of gloves to the glove donning system is greatly facilitated.

Brief Description of the Drawings

FIG. 1 is a front view of an overall glove donning 20 system according to an embodiment of the invention, illustrating an initial state where sliding doors are closed;

FIG. 2 is a front view of the overall glove donning system in FIG. 1, illustrating an operating state where 25 the sliding doors are open;

FIG. 3 is a front view of a right-handed glove used with the glove donning system shown in FIG. 1;

FIG. 4 is a front view showing a magazine storing 30 therein right-handed gloves, with a portion omitted or cut away;

FIG. 5 is a top view of the magazine shown in FIG. 4;

FIG. 6 is a transverse sectional view taken along VI-VI of FIG. 4;

FIG. 7 is a longitudinal sectional view of the 35 magazine in the initial state before a glove opening

mechanism starts its operation;

FIG. 8 is a longitudinal sectional view showing an essential part of the magazine in an intermediate state after the glove opening mechanism starts its operation;

5 FIG. 9 is a longitudinal sectional view analogous to FIG. 7, showing a variant of the glove opening mechanism;

FIG. 10 is a top view of a door opening mechanism in its initial state;

10 FIG. 11 is a top view of the door opening mechanism in its operating state;

FIG. 12 is a partially broken away top view showing a drive mechanism of the glove opening mechanism in its initial state;

15 FIG. 13 is a sectional side view taken along XIII-XIII of FIG. 12;

FIG. 14 is a side view of the drive mechanism of the glove opening mechanism in FIG. 12 in its operating state;

20 FIG. 15 is a front view of the opening mechanism for right-handed gloves in its initial state, showing the configuration of the essential components thereof;

FIG. 16 is an enlarged, partial cross-sectional view of the right half of the opening mechanism in FIG. 14

25 FIG. 17 is a front view, partially in section, of a drive mechanism of a movable plate for carrying a glove-inter-surface separation plate

FIG. 18 is a front view of the opening mechanism for right-handed gloves in its intermediate state after its operation is started, showing the configuration of the essential components thereof;

30 FIG. 19 is a front view of the opening mechanism for right-handed gloves in its operating state, showing the configuration of the essential components thereof; and

FIG. 20 is an enlarged, partial cross-sectional view of the right half of the opening mechanism in FIG. 19.

35 Best Mode for Carrying Out the Invention

Hereinafter, embodiments of the glove donning system of the present invention will be described in detail with reference to the accompanying drawings. When it is necessary to distinguish between similar members which are 5 respectively positioned on the left, positioned centrally, and positioned on the right, suffixes L (left), C (center), and R (right) are respectively appended to the reference numerals indicating these members.

FIGS. 1 and 2 are front views schematically showing 10 the general configuration of a glove donning system of the invention, respectively illustrating its initial state, in which sliding doors are closed, and its operating state, in which these doors are open.

Referring to FIGS. 1 and 2, the glove donning system 15 1 comprises a housing 2. Double leaf sliding doors 4L, 4R are provided at the front side of the housing 2. Each of the double leaf sliding doors 4L, 4R is made up of a pair of door members 3L, 3R designed to slidably move away from or toward one another. A magazine 5L storing therein 20 a large number of left-handed gloves GL is removably mounted to the housing 2 behind the left-hand double leaf sliding door 4L, while a magazine 5R storing therein a large number of right-handed gloves GR is removably mounted to the housing 2 behind the right-hand double leaf 25 sliding door 4R. The magazines 5L, 5R are adapted to be mounted to and removed from the housing 2 from above, with a cover 21 over the top of the housing 2 being opened.

This glove donning system 1 is designed such that all 30 of the mechanisms are actuated simultaneously by pressing a foot-operated pedal 7 placed under the right-hand door 4, and returned to their respective initial states when the pedal 7 is released. A driving wire 6, which extends upward from the pedal 7 through a main base 24, is attached at one end to the pedal 7, and at the other end 35 to a sliding base 27 disposed on the main base 24 (see FIG.

9 and FIG. 12).

When the pedal 7 is pressed under the initial state where the doors 4L, 4R are closed as shown in FIG. 1, the driving wire 6 is pulled downward to operate a door opening mechanism, to be described later. This causes the left-hand door members 3L and the right-hand door members 3R of the doors 4L, 4R to slide respectively leftward and rightward and the state shown in FIG. 2 is brought about, whereby the forefront gloves GL, GR are exposed at the forefront of the housing 2. Simultaneously, a glove opening mechanism, to be described later, is also operated by the aforementioned driving wire, whereby glove-inter-surface separation plates 22, 22 included in the glove opening mechanism are caused to open the upward-facing cuff of each forefront glove GL, GR to an extent that enables the corresponding hand to be inserted into the cuff. Each door member 3L, 3R is provided with two ball bearings 25, so that smooth closing and opening movement of the doors 4L, 4R is ensured.

FIG. 3 is a front view of a right-handed glove GR, and FIG. 4 to FIG. 8 show, with a portion omitted or cut away, a magazine 5R storing therein a large number (up to about 500 pieces) of right-handed gloves GR. More specifically, FIG. 4 is a front view and FIG. 5 is a top view, showing the magazine 5R. FIG. 6 is a transverse sectional view taken along line VI-VI of FIG. 4, FIG. 7 is a longitudinal sectional view illustrating the initial state of the magazine before a glove opening mechanism is actuated, and FIG. 8 is a similar longitudinal sectional view showing an essential part of the magazine in an intermediate state after the glove opening mechanism is actuated.

As is apparent from FIG. 3, the gloves GR (also the gloves GL) are fabricated from a substantially unstretchable thin polyethylene film which are aligned in

the longitudinal direction, arranged in a single row. The gloves GR are mounted, as shown in FIG. 4, such that they hang in the magazine 5R and are arranged one behind the other (i.e., in the depth direction) of the magazine 5R, 5 with the palm side part of the glove facing forward (i.e., in the direction toward the user), the cuff 8 being directed upward, and the palm side part and the back side part of the glove being in intimate contact with each other.

10 The glove GR includes a cuff edge 8_D of the palm side part and a cuff edge 8_U of the back side part, both of which extend laterally in a straight line as viewed in FIGS. 3 and 4, respectively. However, the positions (heights) of both cuff edges 8_D and 8_U do not correspond 15 with each other. More specifically, the glove is formed such that the cuff edge 8_D of the palm side part to be placed in front is offset closer to the glove fingers, that is, to a lower position in a hanging state, compared with the cuff edge 8_U of the back side part. Small holes 20 10, 10 are formed on the lateral ends of the glove, in the vicinity of the cuff edge 8_U of the back side part above the cuff edge 8_D of the palm side part. Further, a perforated line (frangible portion) 11 extends from each 25 of the small holes 10 to the cuff edge 8_U located thereabove.

The small holes 10, 10 are the mounting apertures for receiving two holding rods 9, 9 which are provided in the magazine 5R in order to hold the gloves GR securely in a suspended manner. The holding rods 9 extend substantially 30 horizontally in the front-rear direction. The perforated lines (frangible portions) 11, 11 mentioned above facilitate the release of the glove GR donned onto a hand from the holding rods 9, 9. More specifically, once the hand and fingers are inserted through the opened cuff of 35 the forefront one of the gloves GR hanging from the

holding rods 9, 9 within the magazine 5R and the glove GR is on the hand, moving the gloved hand downward causes the breakage of the perforated lines (frangible portions) 11, 11, thereby communicating the small holes 10, 10 with the 5 cuff edge 8u. It should be understood that while the small hole 10, 10 for hanging the glove is typically formed in the round shape corresponding to the cross sectional shape of the holding rods 9, 9, the present invention not limited thereto, and any other appropriate shape capable 10 of receiving the support 9, 9, for example, a cruciform slit, may be employed.

The magazine 5R is formed in the shape of box with an open front, and, as is apparent from FIG. 5, the central portion of the front end 5b of the upper wall 5a is cut 15 out to be concave rearward. From the rear face of a laterally-extending elongate glove-support plate 12, the holding rods 9, 9 extend rearward in the direction perpendicular to the surface of the support plate 12. The rear ends, which are free ends, of the holding rods 9, 9 20 are inserted into a large number of gloves GR through the small holes 10, 10 thereof. A bracket 13, shaped like a letter L seen from the side, is welded to the upper portion of the rear surface of the support plate 12. As is apparent from FIG. 7, the support plate 12 extends 25 downward from the concave-rearward front end 5b of the upper wall 5a of the magazine 5R. The support plate 12 is adapted to be releasably fixed to the upper wall 5a of the magazine 5R via the bracket 13 with the surface thereof facing forward and disposed parallel to the front surface 30 of the magazine 5R.

The magazine 5R includes the pressing plate 15 which pushes the upper part of the gloves, hanging from the holding rods 9, 9, forward. A pair of rods 16, 16 is fastened to the rear surface of the pressing plate 15 and 35 extends rearward from the left and right end portions

thereof through a rear wall 5c of the magazine 5. A coil spring 17 is inserted over each of the rods 16, 16 and positioned in a compressed state between the pressing plate 15 and the rear wall 5c of the magazine 5. This 5 arrangement allows the coil spring to urge the pressing plate 15 forward, and in turn press the upper part of the gloves against the rear surface of the support plate 12. The holding rods 9, 9 are loosely fitted through the pressing plate 15, and a pair pressing blocks 18, 18 are 10 fastened to the lateral ends of the front surface of the pressing plate 15 such that they extend forward. A coil spring 19, wound with a relatively small pitch, is horizontally stretched between the pressing blocks 18, 18. The pressing blocks 18, 18 and coil spring 19 are 15 positioned at a level that the pressing blocks 18, 18 and coil spring 19 can exert a pressure from behind on a portion slightly below the palm side cuff edge 8D of the rearmost glove GR.

A pair of hold-down rollers 20, 20, laterally spaced 20 apart similar to the pressing blocks 18, 18, is provided on both left and right ends of the front surface of the magazine 5R so as to be located slightly below the pressing blocks 18, 18. These hold-down rollers 20, 20 are, as clearly shown in FIGS. 4 and 7, placed in contact with 25 both ends of the foremost glove GR slightly below the palm side cuff edge 8D thereof. More specifically, a region slightly below the palm side cuff edge 8D of the gloves GR hanging from the holding rods 9, 9 is pressed from behind by the pressing blocks 18, 18 and the coil spring 19, 30 which is stretched between the pressing blocks 18, 18, while the lateral end portions of the gloves GR located slightly below this pressed region are held down from front by the hold-down rollers 20, 20. This causes the 35 respective gloves, stored in the magazine 5R in a hanging state, to be bulged forward, as seen in FIG. 7, at a

region near the cuff edge 8_D of the palm side part thereof. Considering the forward glove, the back side part near the palm side cuff edge 8_D bulges forwards, as a result of which the palm side cuff edge 8_D is caused to open forward.

5 In this initial state, as seen in FIG. 7, a pair of glove-inter-surface separation plates 22, 22 (see FIG. 1, FIG. 15), which extends downward and partly constitutes the glove opening mechanism, is disposed in front of the central portion of the support plate 12 above the

10 aforementioned bulged region.

When the glove opening mechanism, shown in the drawings beginning with Fig. 15 described later, is actuated while at the same time the doors 4L, 4R are opened from this initial state by depressing the pedal 7, 15 the pair of glove-inter-surface separation plates 22, 22 descend along the front surface of the foremost glove toward the cuff edge 8_D of the palm side part thereof. Each of the glove-inter-surface separation plates 22, 22 has a lower portion 22a which is bent backward as shown in 20 FIG. 7. Therefore, when the glove-inter-surface separation plates 22, 22 move downward, the lower end of each glove-inter-surface separation plate 22, 22 is brought into contact with the bulged region, which is located close to the cuff edge 8_D of the palm side part of the forefront 25 glove, of the back side part thereof. Accordingly, the glove-inter-surface separation plates 22, 22 press this bulged region backward. The pressing force applied thereto is transmitted to the central portion of the coil spring 19 via the gloves, and as a result of which the central 30 portion of the coil spring 19 is elastically deflected backward as shown in FIG 8. Thus, the bulged region of the back side part of the glove is moved backward and the glove-inter-surface separation plates 22, 22 are inserted 35 into the glove GR while sliding along the inner surface of the back side part thereof. The glove-inter-surface

separation plates 22, 22 inserted into the glove GR are, then, moved downward while moving horizontally as mentioned above. Subsequently, the glove-inter-surface separation plates 22, 22 are rotated about 90° around 5 vertically extending shafts, thereby opening the cuff of the glove GR to the extent sufficient to enable the corresponding hand to be inserted therethrough.

As one alternative, another construction as shown in FIG. 9 where the rear of the holding rod 9 is fixed and a 10 thin glove-support plate 12 is lightly contacted with the front end of the holding rod 9 may be contemplated. This construction has an advantage in that it is no longer necessary to provide perforated lines in the glove since the glove can be removed from the front end of the holding 15 rod 9.

The door opening mechanism and a drive mechanism of the glove opening mechanism are provided on the main base 24 of the housing 2. First, the door opening mechanism will be described with reference to FIGS. 10 and 11. FIG. 20 10 is a top view showing the initial state corresponding to FIG. 1 where the doors 4L, 4R are closed, and FIG. 11 is a top view showing the operating state corresponding to FIG. 2 where the doors 4L, 4R are open.

Referring to FIG. 10, a pair of guide rods 26, 26 that extend laterally in the horizontal direction is secured to the rear part of the main base 24. A sliding base 27 extending forward in the horizontal direction is provided in a manner slidable along the guide rods 26, 26. A driving wire 6, attached at one end to the pedal 7 mentioned above, extends through a hole 24a formed in the 30 main base 24, and bent leftward at a right angle by a pulley 33 provided on the main base 24 such that the driving wire 6 is parallel to the guide rods 26, 26. The other end of the driving wire 6 is attached to the sliding 35 base 27.

A connecting member 28L for connecting left-hand door members 3L, 3L of the respective doors 4L, 4R, and a connecting member 28R for connecting right-hand door members 3R, 3R of the respective doors 4L, 4R are provided 5 on the main base 24 in a laterally movable manner. These connecting members 28L, 28R are connected on the opposite ends of a rotary member 30 by means of engagement between a pin and an elongate hole. The rotary member 30 is rotatably supported by a vertical shaft 29 provided on the 10 main base 24. The connection points of rotary member 30, at which the connecting members 28L, 28R are connected, are equi-spaced from the vertical shaft 29. The connecting member 28R is connected to the sliding base 27 via the connecting wire 31 extending along the guide rods 26, 26. 15 Further, a laterally extending pulling element 32 is attached at one end to the tip of the rotary member 30 located closer to the connecting member 28R, and engaged at the other end with the main base 24. This construction allows the connecting member 28L and the connecting member 20 28R to be resiliently urged rightward and leftward, respectively. As a consequence, the doors 4L, 4R are held closed, and the sliding base 27 is positioned at the left end of its stroke such that the pedal 7 is held at the initial position shown in FIG. 1.

25 When the pedal 7 is pressed under this initial state, the sliding base 27 is pulled and moved rightward by the driving wire 6, and the state shown in FIG. 11 is brought about. Accordingly, the connecting member 28R is moved rightward against the urging force of the pulling element 30 32, while the rotary member 30 is rotated in the clockwise direction to cause the connecting member 28L to move leftward, whereby the doors 4L, 4R are opened. When the pedal 7 is released, the sliding base 27 and the connecting members 28R, 28L return to their initial states 35 shown in FIG. 9 by the urging force of a spring 32.

FIGS. 12 to 14 show a drive mechanism for driving the glove opening mechanism shown in the drawings beginning with Fig. 15. More specifically, FIG. 12 is a partially broken-away top view illustrating the initial state, FIG. 5 13 is a sectional side view taken along line XIII-XIII of FIG. 12, and FIG. 14 is a side view illustrating the operating state.

Vertically extending columns 34L, 34C, 34R are positioned at the opposite ends and center in the rear 10 part of the main base 24 such that they are laterally spaced at a predetermined distance. Forwardly extending Arms 35L, 35C, 35R are supported at their proximal ends respectively by the columns 34L, 34C, 34R in a manner 15 pivotable around their respective axes laterally extending in the horizontal direction. The arms 35L, 35C, 35R are designed to be connected to one another by three connecting members 36, 37, 38 so as to be pivotable as one, and a wire 39, attached at one end to the front end of the aforementioned sliding base 27 and extending leftward, is 20 bent upward at a right angle by a pulley 40 and engaged at the other end with the front end of the central arm 35C. With this construction, depressing the pedal 7 allows the arms 35L, 35C, 35R, which are tilted so that their front ends are above their rear ends in the initial state shown 25 in FIG. 12, to pivot at a time into the state where the arms 35L, 35C, 35R are tilted so that the state where the front ends thereof are positioned below their rear ends as shown in FIG 13 are brought about.

An elongate subbase extending in the front-rear 30 direction is placed above the main base 24 of the housing 2 and fixedly disposed in the locations designated by broken lines 14L, 14C, 14R in FIGS. 1 and 2 so as to be held in a horizontal position. Link mechanisms 42L, 42C, 42R (detailed descriptions thereof is omitted) formed from 35 a plurality of link plates are provided on the subbases

14L, 14C, 14R, respectively. The link mechanisms 42L, 42C, 42R serve to convert the vertical movements of the arms 35L, 35C, 35R produced at the distal end thereof so as to be reduced to the vertical movements of a predetermined 5 distance necessary for drive members 45L, 45C, 45R of the glove opening mechanism, prior to the transmission to the drive members 45L, 45C, 45R. Connecting members 41L, 41C, 41R, which extend in the vertical direction respectively through the subbases 14L, 14C, 14R, are provided to 10 connect the tips of the arms 35L, 35C, 35R to the link mechanisms 42L, 42C, 42R, respectively. The tips of the link plates 43L, 43C, 43R, which are respectively located at the distal ends of the link mechanisms 42L, 42C, 42R, are connected to the drive members 45L, 45C, 45R, which 15 are provided to be movable in the vertical direction.

FIG. 15 is a front view of the opening mechanism for right-handed gloves GR in its initial state, showing the configuration of the essential components thereof, and FIG. 16 is an enlarged, partial cross-sectional view of the 20 right half of the opening mechanism in FIG. 14. FIG. 17 is a front view, partially in section, of a drive mechanism of a movable plate for carrying a glove-inter-surface separation plates, FIG. 18 is a front view of the opening mechanism for right-handed gloves GR in its intermediate 25 state after the opening mechanism starts its operation, showing the configuration of the essential components thereof, FIG. 19 is a front view of the opening mechanism for right-handed gloves GR in its operating state, showing the configuration of the essential components thereof, and 30 FIG. 20 is an enlarged, partial cross-sectional view of the right half of the opening mechanism in FIG. 19. The glove opening mechanism for the left-handed gloves GL has the same constituent elements as of the glove opening mechanism for the right-handed gloves GR, and the right 35 half and the left half of each glove opening mechanism are

mirror images of each other in front view. Therefore, only the right half of the opening mechanism for the right-handed glove GR will be described in further detail herein. Note that the glove-support plate 12 is omitted in the 5 drawings beginning with FIG. 15.

As has been described in connection with FIGS. 7 and 8, the pair of glove-inter-surface separation plates 22, 22 is lowered along the front surface of the foremost glove GR toward the cuff edge 8D of the palm side part 10 thereof and inserted in the glove. More particularly, the right-hand glove-inter-surface separation plate 22 is rotatably supported by a rectangular movable plate 50 of oblong shape in the lateral direction. The movable plate 50 is adapted to be moved in translation from the initial 15 position to the lower right as viewed in FIG. 14.

As seen in FIG. 15, the glove-inter-surface separation plate 22 illustrated on the right side in this figure is rotatably supported at the upper end of a vertical shaft 51 which is disposed at a rear inside 20 corner of the movable plate 50 so as to extend along the right-side contour of the glove-inter-surface separation plate 22. A short arm 53, having a roller 52 at a distal end thereof, projects to the right from the lower end of the vertical shaft 51, and thus the short arm 53 rotates 25 as one with the glove-inter-surface separation plate 22. This arm 53, together with the glove-inter-surface separation plate 22, is urged to rotate about the shaft 51 in the clockwise direction as viewed in FIG. 16 by a pulling spring 54 stretched between the end portion of the 30 arm 53 and the movable plate 50. Further, the arm 53 is in abutment against a stopper 55 which is fixed on the lower surface of the movable plate 50. Thereby, the glove-inter-surface separation plate 22 is held in the initial center 35 position with the front surface facing front as shown in FIG. 15.

A holding member 59 including a retaining surface 59a facing in the leftward direction perpendicular to the plane of the drawing sheet of FIG. 15 is provided on the subbase 14R under the movable plate 50 in a manner such 5 that a glove retaining member 59 is allowed to laterally move a short distance while being urged leftward by a spring 64.

Further, a pair of laterally extending cam plates 57, 57 is fixed on the subbase 14R such that the pair takes up 10 a vertical position while sandwiching therebetween the movable plate 50 from the front and back sides. Two cam grooves 58, 58 are formed in each cam plate 57. Each cam groove 58 is made up of a cam groove section 58a, extending obliquely from above toward lower right, and a 15 cam groove section 58b, extending horizontally from the lower end of the cam groove section 58a toward right. The two cam grooves 58, 58 provided in each of the front and rear cam plates 57, 57 are, as shown in FIG. 15, located to superpose one another as seen from the front. Rollers 20 60, 60, each of which is rotatable around a shaft extending horizontally in the front-rear direction, respectively project from the front and rear side-walls of the movable plate 50. The rollers 60, 60 serve as cam followers and engaged with the top portions of the cam 25 groove sections 58a, 58a.

Further, a pivot arm 62 having a shape shown in enlarged scale in FIG. 17 is pivotally supported at the proximal end thereof by a column 61 standing upright on the subbase 14R such that it can pivot freely in a plane 30 parallel to that of the drawing sheet of FIG. 16. The pivot arm 62 comprises an arm portion 62a which extends horizontally from its proximal end to the left in the initial position shown in phantom lines in FIG. 17, and an arm portion 62b which projects upward at some midpoint of 35 the arm 62a, and accordingly is formed in a substantially

inverted T shape. An elongate hole 62c extending along the arm portion 62a is formed at an distal end of the arm portion 62a, while a roller 63 is provided at a distal end of the arm portion 62b projecting upward. The roller 63 is 5 engaged with a horizontally extending elongate hole 45a formed at a top portion of the drive member 45R shown in phantom lines in FIG. 17. Accordingly, as the drive member 45R lowers from the upper initial position to the lower operating position, the pivot arm 62 is rotated in the 10 counter-clockwise direction from the initial position shown in phantom lines to the operating position shown in solid lines in FIG. 16.

As can be seen from FIG. 16, a slit 50a is cut into the movable plate 50 from its right edge to the left along 15 the center line. The tip of the arm portion 62a of the pivot arm 62 is inserted in the slit 50a. Within the slit 50a, a roller 65, which is rotatable around a shaft extending horizontally in the front-rear direction (vertical direction as viewed in FIG. 16), is rotatably 20 supported at a position corresponding to the intermediate position between the rollers 60, 60 when viewed in lateral direction. This roller 65 is engaged with the elongate hole 62c of the arm portion 62a of the pivot arm 62. Accordingly, as the drive member 45R lowers from the upper 25 initial position shown in phantom lines in FIG. 17 to the lower operating position also shown in phantom lines, the pivot arm 62 is rotated in the counter-clockwise direction, whereby the movable plate 50 is allowed to move together 30 with the glove-inter-surface separation plate 22 in translation towards the lower right while lowering its four rollers along the cam groove section 58a. This causes the right-hand glove-inter-surface separation plate 22 to be inserted into the glove GR from the cuff edge 8D of the palm side part of the glove GR in a manner as shown in FIG. 35 8. Then, when the rollers 60, 60 respectively reach the

respective lower ends of the cam grooves 58a, 58a, the right-hand glove-inter-surface separation plate 22 reaches a position in the vicinity of the lateral end of the cuff 8 of the glove GR as shown in FIG. 18.

5 As has been described above, the movable plate 50 is provided with the arm 53, which comprises the roller 52 and is rotatable as one with the glove-inter-surface separation plate 22. In addition, a cam plate 66 is secured at the bottom of the cam plate 57 and when the 10 movable plate 50 lowers to a position shown in FIG. 18, the cam surface 66 is opposed to the aforementioned roller 53 as a cam follower.

As the drive member 45R further lowers to the position shown in solid lines in FIG. 17, the rollers 60, 15 60 of the movable plate 40 move horizontally to the right along the cam groove section 58b, whereby the movable plate 50 also reaches the position shown in solid lines in FIG. 17. Along with this, the roller 52 of the arm 53 is engaged with the cam surface 66a of the cam plate 66, and 20 the arm 53 is rotated 90° in the counter-clockwise direction as viewed in FIG. 15 about the shaft 51 while stretching the spring 54, whereby glove-inter-surface separation plate 22 is also rotated in the counter-clockwise direction to take a position perpendicular to 25 the plane of the drawing sheet of FIG. 19, and the cuff 8 of the glove GR is opened as shown in FIGS. 18 and 19. The glove-inter-surface separation plate 22 now positioned 30 perpendicularly to the plane of the drawing sheet of FIG. 19 serves to press the right side surface of the cuff 8 of the glove GR against the retaining surface 59a of the aforementioned retaining member 59, whereby the retaining member 59 slightly retracts to the right while compressing 35 the spring 64. As a result, the right side surface of the cuff 8 of the opened glove GR is sandwiched and held between the glove-inter-surface separation plate 22 and

the retaining surface 59a by the urging force of the spring 64.

As can be seen from the front views shown in FIGS. 15, 18, and 19, this glove opening mechanism is configured to 5 be symmetrical in the left-right direction. Therefore, similar to the right hand glove-inter-surface separation plate 22, the left hand glove-inter-surface separation plate 22 is also driven to rotate in the clockwise direction by the drive member 45C which a two-forked arm 10 component extending in both left-right directions at the top thereof. This causes the cuff 8 of the glove GR to open, and the left side surface of the cuff 8 of the opened glove GR is sandwiched and held between the glove-inter-surface separation plate 22 and the retaining 15 surface 59a by the urging force of the spring 64. Consequently, the entire cuff 8 of the glove GR is opened to the extent sufficient to enable the hand to be inserted therethrough and supported by a force sufficient to enable the hand to be inserted therethrough.

20 Simultaneously, the cuff 8 of the left-handed glove GL is also opened to the extent sufficient to enable the hand to be inserted therethrough and supported by a force sufficient to enable the hand to be inserted therethrough.

After donning the gloves GL, GR by inserting both 25 hands through the cuffs 8, 8 of the gloves GL, GR in this state, when a force pressing the gloves GL, GR downward is further applied by both hands, the perforated lines 11, 11 which extend between the cuff edges 8_U of the glove back side parts of the gloves GL, GR and the mounting holes 10, 30 10 are broken, whereby the mounting holes 10, 10 and the cuff edges 8_U communicate with each other. This enables disengagement of the gloves GL, GR from the holdings rod 9, 9, and simultaneous downward removal of the gloves GL, GR sandwiched and held between the glove-inter-surface 35 separation plates 22 and the holding surfaces 59a. Then

the next gloves GL, FR are pushed forward by the pressing plates 15 and placed at the forefront within the magazines 5L, 5R.

After the gloves GL, GR are donned onto the hands as 5 described above, when both hands are removed from the glove donning system 1 and the previously pressed pedal 7 is released, the doors 4L, 4R are closed and return to the initial state shown in FIG. 1.

As is evident from the foregoing description, 10 according to the particular embodiments described above, left-handed and right-handed gloves GL, GR are provided such that a cuff edge 8D of a palm side part is offset closer to the glove fingers compared with the cuff edge 8U of the back side part, and small holes 10, 10 are formed 15 in the back side part in the vicinity of the cuff edge 8U such that holding rods 9, 9 can pass through the gloves at a section above the lower cuff edge 8D, and thereby holding the gloves in a hanging state with the cuff 8 being directed upward. A plurality of each glove GL, GR is 20 inserted over the holding rods 9, 9, which extend in the front-rear direction, with the palm side part being placed in front, and hung in the magazines 5L, 5R with the gloves arranged one behind the other. Pressing the pedal 7 causes 25 the glove-inter-surface separation plates 22, 22 to insert into the glove from the forefront cuff edge 8D to open the cuff 8 to the extent sufficient to enable the hand to insert therethrough. Thus, it is possible to don gloves onto hands in a moment merely by inserting the hands through the cuffs of the forefront gloves, without loss of 30 hygiene of the gloves.

Since easily broken frangible portions such as 35 perforated lines 11, 11 are provided between the mounting holes 10, 10, which is formed in the back side part of each glove GL, GR in the vicinity of the cuff edge 8U and through which the holding rods 9, 9 are passed, and the

cuff edge 8_U, the gloves can be disengaged from the holding rods 9, 9 only by applying a slight force to the gloves after donning the gloves. In addition, the donning of the gloves is carried out according to a set of 5 procedures of pressing the pedal 7 under the initial state, donning the gloves GL, GR onto both hands by inserting both hands into the glove donning system 1, removing the gloved hands from the glove donning system 1, and releasing the pedal 7 can be completed in a very short 10 time of merely 2 seconds. This brings out a beneficial effect that the glove donning can be completed in a very short time, namely 2 seconds.

Further, the foregoing glove opening mechanism comprises a pair of glove-inter-surface separation plates 15 22, 22, which is inserted from above into the glove through the front lower cuff edge 8_D such that the plates are held in a position substantially parallel to the cuff edge 8_D, and then rotated about 90° respectively around vertically extending shafts 51, and thus the cuff 8 of the 20 glove is opened. Accordingly, opening the glove cuff 8 to the extent sufficient to enable the hand to be inserted therethrough is significantly facilitated. Also here, the opening mechanism further comprises pressing blocks 18, 18 and a coil spring 19 both of which are provided for 25 resiliently pressing forward a portion, located in the vicinity of the cuff edge 8_D disposed below the other, of the rearmost one of the gloves housed in a hanging state in the magazine 5L, 5R from behind. This causes the respective hanging gloves to be bulged forward at a 30 region near the lower cuff edge 8_D, whereby the lower cuff edge 8_D facing forward of each forefront glove is separated forward. Accordingly, inserting the pair of glove-inter-surface separation plates 22, 22 into the glove through the lower cuff edge 8_D is facilitated.

35 Further, with the present invention, glove housing

magazines 5L, 5R are used as hanging means for hanging the gloves having the features mentioned above with the gloves being arranged one behind the other, whereby, advantageously, the mounting and replenishing of the 5 gloves with respect to the glove donning system 1 is greatly facilitated.

Further, according to the embodiment of the invention, the glove opening mechanism is designed to be purely mechanically operated only by depressing the pedal 7, 10 without requiring any power source such as power supply or compressed air. Therefore, the system can be advantageously placed at any desired location.